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# RIPARIAN AREA MANAGEMENT

## TR 1737-11 1994

## *Process for Assessing Proper Functioning Condition for Lentic Riparian-Wetland Areas*

Clay Bridges

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# RIPARIAN AREA MANAGEMENT

*Process for Assessing Proper Functioning Condition for Lentic Riparian-Wetland Areas*

by

U.S. Department of the Interior
Bureau of Land Management
Lentic Riparian-Wetland Area
Proper Functioning Condition Work Group

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# Process for Assessing Proper Functioning Condition for Lentic Riparian-Wetland Areas

## I. Introduction

Federal policy defines wetlands as ***areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and which, under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions***. Bureau of Land Management (BLM) Manual 1737 (USDI, 1992), *Riparian-Wetland Area Management,* includes ***marshes, shallow swamps, lakeshores, bogs, muskegs, wet meadows, estuaries, and riparian areas as wetlands.***

Riparian-wetland areas, though they comprise less than 9 percent of the total land base, are the most productive and highly prized resources found on BLM lands. Riparian-wetland areas play a significant role in restoring and maintaining the chemical, physical, and biological integrity of the nation's water. Wildlife use riparian-wetland areas disproportionately more than any other type of habitat. In addition, riparian-wetland areas are highly prized for their economic values and other uses such as livestock production and recreation.

Riparian-wetland areas' soils, vegetation, and hydrology vary as a result of many factors; therefore, they are grouped into two major categories: 1) lentic, which is standing water habitat such as lakes, ponds, seeps, bogs, and meadows, and 2) lotic, which is running water habitat such as rivers, streams, and springs.

### A. Purpose

The BLM's *Riparian-Wetland Initiative for the 1990's* (USDI, 1991) document establishes national goals and objectives for managing riparian-wetland resources on public lands. This initiative's chief goal, comprised of two parts, is to: 1) restore and maintain riparian-wetland areas so that 75 percent or more are in proper functioning condition (PFC) by 1997 and 2) to achieve an advanced ecological status, except where resource management objectives, including PFC, would require an earlier successional stage, thus providing the widest variety of habitat diversity for wildlife, fish, and watershed protection. The *Riparian-Wetland Initiative for the 1990's* also contains a strategy to focus management on the entire watershed. Knowing the condition of the watershed is an important component in assessing whether a riparian-wetland area is functioning properly.

The purpose of this document is to provide a thought process for assessing PFC for lentic riparian-wetland areas on BLM-managed lands. This document supplements Technical Reference (TR) 1737-9, ***Process for Assessing Proper Functioning Condition*** (Prichard et al., 1993), which was principally designed for lotic riparian-wetland areas.

## B. Approach

BLM defines lentic riparian-wetland resources the same way they define lotic riparian-wetland resources, i.e., resources whose capabilities and potentials are defined by the interaction of three physical components: 1) vegetation, 2) landform/soils, and 3) hydrology. As for lotic riparian-wetland areas, some resource specialists regard fish and wildlife as a fourth element because of the ability of some wildlife species to alter a riparian-wetland area's capability and potential. Classifiers usually place wildlife species that have the ability to alter a riparian-wetland area's capability and potential as a special modifier under the hydrology component. Whether fish and wildlife species are dealt with as a resource component or identified as a special modifier, noting their presence and/or condition is important when assessing PFC of a lentic riparian-wetland area.

Since lentic riparian-wetland areas are characterized by the interactions of vegetation, soils, and hydrology and these areas are important to fish and wildlife, **the process of assessing whether a riparian-wetland area is functioning properly requires an interdisciplinary (ID) team**. The team should include, but not be limited to, specialists knowledgeable about vegetation, soil, and hydrology attributes and processes and fish and wildlife values.

## C. Definitions

To comprehend how a lentic riparian-wetland area operates, and to set in motion proper management practices that ensure it is functioning properly, **the capability and potential of the area must be understood**. Evaluating functionality is based upon an area's capability and potential. This document uses the same definitions for capability and potential that were used in TR 1737-9:

> **Capability** - The highest ecological status a riparian-wetland area can attain given political, social, or economical constraints. These constraints are often referred to as limiting factors.
>
> **Potential** - The highest ecological status an area can attain given no political, social, or economical constraints; often referred to as the "potential natural community" (PNC).

BLM Manual 1737, ***Riparian-Wetland Area Management*** (USDI, 1992), and TR 1737-9, establish definitions for proper functioning condition, functional—at risk, nonfunctional, and unknown when assessing functionality of riparian-wetland areas. Even though these definitions feature lotic riparian-wetland areas, they can be applied to lentic riparian-wetland areas with minor modifications. For example, instead of assessing whether adequate vegetation is present to dissipate stream energies, an assessment would determine whether adequate vegetation is present to dissipate wind and wave energies, thereby reducing erosion and improving water quality.

## II. Process

The process described in TR 1737-9 concentrated on assessing functional condition of lotic riparian-wetland areas for two reasons: 1) they are the form of wetland BLM most frequently has to resolve conflicts on and 2) inventory, classification, and monitoring efforts within and outside the Bureau have concentrated on this type of resource. However, the basic process to assess functioning condition on lentic forms of riparian-wetlands would be much the same, except that: 1) different attributes and processes define an area's capability and potential and 2) the attributes and processes of soil and vegetation play a stronger role in establishing functionality, while hydrology plays a lesser role.

### A. Review Existing Documents

TR 1737-9 should be reviewed before assessing functioning condition of lentic riparian-wetland areas. TR 1737-9 identifies a number of documents that provide a basis for assessing PFC. It also identifies additional documents that provide thought processes that will be useful in assessing functional status of riparian-wetland areas.

Like lotic riparian-wetland areas, the level of information necessary to assess PFC for lentic riparian-wetland areas will vary. Some will require the magnitude of effort provided by an Ecological Site Inventory (ESI) to assess functionality, while others can be assessed by using a checklist. Information pertaining to application of ESI can be found in TR 1737-7, ***Procedures for Ecological Site Inventory—With Special Reference to Riparian-Wetland Sites*** (Leonard et al., 1992).

Whether employing ESI or a checklist to assess functioning condition, existing files from BLM and other agencies should be reviewed for pertinent information. Information may exist to assess functionality for some riparian-wetland areas without having to go to the field. For others, the information will be useful in establishing capability and potential or trend.

### B. Analyze the Definition

In assessing PFC for lentic riparian-wetland areas, the definition of PFC must be analyzed, but adjusted for lentic areas. One way to do this is by breaking the definition down as follows:

> Lentic riparian-wetland areas are functioning properly when adequate vegetation, landform, or debris is present to:
>
> 1) dissipate energies associated with wind action, wave action, and overland flow from adjacent sites, thereby reducing erosion and improving water quality;
> 2) filter sediment and aid floodplain development;
> 3) improve flood-water retention and ground-water recharge;
> 4) develop root masses that stabilize islands and shoreline features against cutting action;

5) restrict water percolation;
6) develop diverse ponding characteristics to provide the habitat and water depth, duration, and temperature necessary for fish production, waterbird breeding, and other uses;
7) and support greater biodiversity.

Lentic riparian-wetland areas are functioning properly when there is adequate structure present to provide the listed benefits ***applicable*** to a particular area. The analysis must be based on the riparian-wetland area's capability and potential. If, for example, the system ***does not have the potential*** to support waterfowl habitat, that criteria would not be used in the assessment.

## C. Assess Functionality

### *1. Attributes and Processes*

Assessing PFC for a lentic riparian-wetland area, just as for a lotic riparian-wetland area, involves understanding the attributes and processes occurring in that area. Table 1 provides a list of attributes and processes that may occur in any given lentic riparian-wetland area. When assessing PFC, attributes and processes for the area being evaluated need to be identified.

To understand these processes, an example of a palustrine wetland area in both a functional and nonfunctional condition is provided in Figure 1. Applying the Bureau's definitions for PFC, **State A** would be classified as PFC. Important attributes and processes present for **State A** are:

**Hydrogeomorphic** - Continuous permafrost; shoreline shape; and depth, duration, and frequency of inundation.

**Vegetation** - Community types and distribution, recruitment and reproduction, root density, community dynamics, and survival.

**Erosion/Deposition** - Shoreline stability.

**Soils** - Distribution of anaerobic soil and ponding frequency and duration.

**Water Quality** - No change.

**Biotic Community** - Aquatic plant recruitment and reproduction and nutrient enrichment.

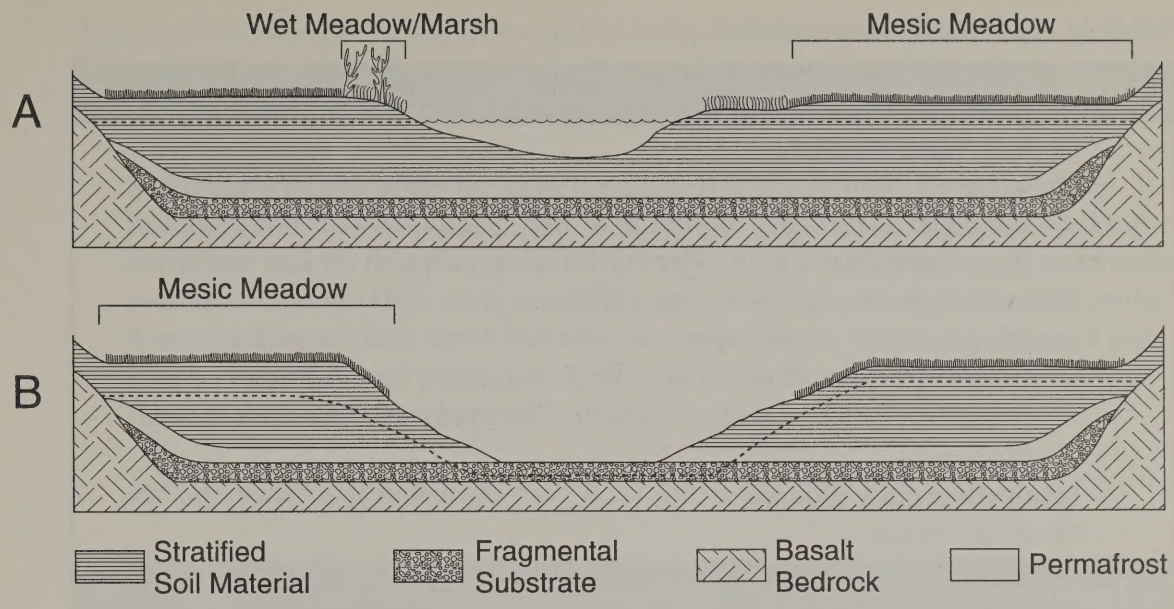



**Figure 1.** Proper functioning condition (A) and nonfunctional condition (B) for a lentic palustrine wetland area.

Land activities that disrupt the permafrost layer would result in **State A** progressing to **State B**. **State B** would be classified as nonfunctional. The following changes in attributes/processes are likely in **State B**:

**Hydrogeomorphic** - Continuous permafrost (lost); shoreline shape (changed); and depth, duration, and frequency of inundation (decreased).

**Vegetation** - Community types and distribution (lost/changed), recruitment and reproduction, root density, community dynamics, and survival (decreased).

**Erosion/Deposition** - Shoreline stability (decreased).

**Soils** - Distribution of anaerobic soil and ponding frequency and duration (decreased).

**Water Quality** - Temperature (increased), pH (changed).

**Biotic Community** - Aquatic plant recruitment and reproduction and nutrient enrichment (decreased).

**Table 1.** Attributes/Processes List *

| Hydrogeomorphic |
|---|
| Ground-Water Discharge |
| Permafrost |
| Continuous |
| Discontinuous |
| Flood Modification |
| Inundation |
| Depth |
| Duration |
| Frequency |
| Semipermanently Flooded |
| Shoreline Shape |
| **Vegetation** |
| Community Types |
| Community Type Distribution |
| Surface Density |
| Canopy |
| Community Dynamics and Succession |
| Recruitment/Reproduction |
| Root Density |
| Survival |
| **Erosion/Deposition** |
| Shoreline Stability |
| Depositional Features |
| **Soils** |
| Soil Type |
| Distribution of Aerobic/Anaerobic Soils |
| Annual Pattern of Soil Water States |
| Ponding Frequency and Duration |
| Underlying Materials |
| **Water Quality** |
| Temperature |
| pH |
| Dissolved Solids |
| Dissolved Oxygen |
| **Biotic Community** |
| Aquatic Plants Recruitment/Reproduction |
| Nutrient Enrichment |

* This list provides examples of various attributes/processes that may be present in a riparian-wetland area. By no means is it complete.

The previous example would be found in Alaska and represents one of many types of lentic riparian-wetlands found on public lands. However, it is important to remember that there are other types and that:

> **Riparian-wetland areas do have fundamental commonalities in how they function, but they also have their own unique attributes. Riparian-wetland areas can and do function quite differently. As a result, most areas need to be evaluated against their own capability and potential. Even for similar areas, human influence may have introduced component(s) that have changed the area's capability and potential. Assessments, to be correct, must consider these factors and the uniqueness of each system.**

### *2. Capability and Potential*

Determining functionality of lotic riparian-wetland areas involves determining an area's capability and potential. This is also true for assessing functionality of lentic riparian-wetland areas. The same approach presented in TR 1737-9 can be used for lentic areas and is as follows:

- Look for relic areas (exclosures, preserves, etc.).
- Seek out historic photos, survey notes, and/or documents that indicate historic condition.
- Search out species lists (animals & plants - historic & present).
- Determine species habitat needs (animals & plants) related to species that are/ were present.
- Examine the soils and determine if they were saturated at one time and are now well drained?
- Examine the hydrology; establish the frequency and duration of flooding/ ponding.
- Identify vegetation that currently exists. Are they the same species that occurred historically?
- Determine the entire watershed's general condition and identify its major landform(s).
- Look for limiting factors, both human-caused and natural, and determine if they can be corrected.

This approach forms the basis for initiating an inventory effort like ESI. For some areas, conducting an ESI effort will be the only way to assess an area's capability and potential.

Some lentic riparian-wetland areas will be prevented from achieving their potential because of limiting factors such as human activities. For lentic riparian-wetland areas, most of these limiting factors can be rectified through proper management. To identify these factors, a limiting factor analysis should be part of any inventory method applied to determine capability and potential.

### *3. Functioning Condition*

When determining whether a lentic riparian-wetland area is functioning properly, it is important to determine the condition of the entire watershed. The entire watershed can influence the quality, abundance, and stability of downstream resources by controlling production of sediment and nutrients, influencing ponding frequency and duration, and modifying the distribution of chemicals throughout the riparian-wetland area.

**Lentic riparian-wetland areas can function properly before they achieve their Potential Plant Community (PPC) or Potential Natural Community (PNC).** The Bureau's definition does not mean PNC or optimal conditions for a particular species have to be achieved to be rated as functioning properly. But the Bureau's goal is to achieve an advanced ecological status, except where resource management objectives, including PFC, would require an earlier successional stage, thus providing the widest variety of habitat diversity for wildlife, fish, and watershed protection. After achieving PFC, management should progress towards achieving a desired plant community (DPC) and then achieving a desired future condition (DFC).

The steps in Figure 2 in TR 1737-9 (page 12) provide an example of the relationship between PFC and vegetation community succession for a lotic riparian-wetland area. This relationship can be applied to lentic riparian-wetland areas as well. If vegetation succession continues uninterrupted (Step 1 to Step 2), the riparian-wetland site will progress through some predictable changes from early seral to PNC (although not necessarily as linearly as depicted). As the vegetation community progresses, the riparian-wetland area will advance through phases of not functioning, functioning — at risk, and properly functioning.

At various stages within this successional process, the riparian-wetland area will provide a variety of values for different uses (Step 4). Optimal conditions for grazing occur when forage is abundant and the area is stable and sustainable (mid-seral). Wildlife goals depend upon the species for which the area is being managed. If the riparian-wetland area is to provide nesting habitat for waterfowl, the optimum conditions might be late seral. If the area is to provide feeding habitat for shorebirds, the optimum condition might be mid-seral. The threshold for any goal is at least PFC because any rating below this would not be sustainable. **For riparian-wetland areas, PFC may occur from early seral to late seral.** Desired plant community (DPC) is then determined based on management objectives through an interdisciplinary approach (Step 5), eventually achieving the desired future condition (Figure 2). **Selection of plant communities and future conditions needs to be balanced within a watershed(s) and within an ecoregion(s).**

When rating functionality, it will be easy to categorize many lentic riparian-wetland areas as PFC or nonfunctional. For others it will not be easy. Difficulty in rating PFC usually arises in identifying the thresholds that allow a riparian-wetland area to move from one category to another.

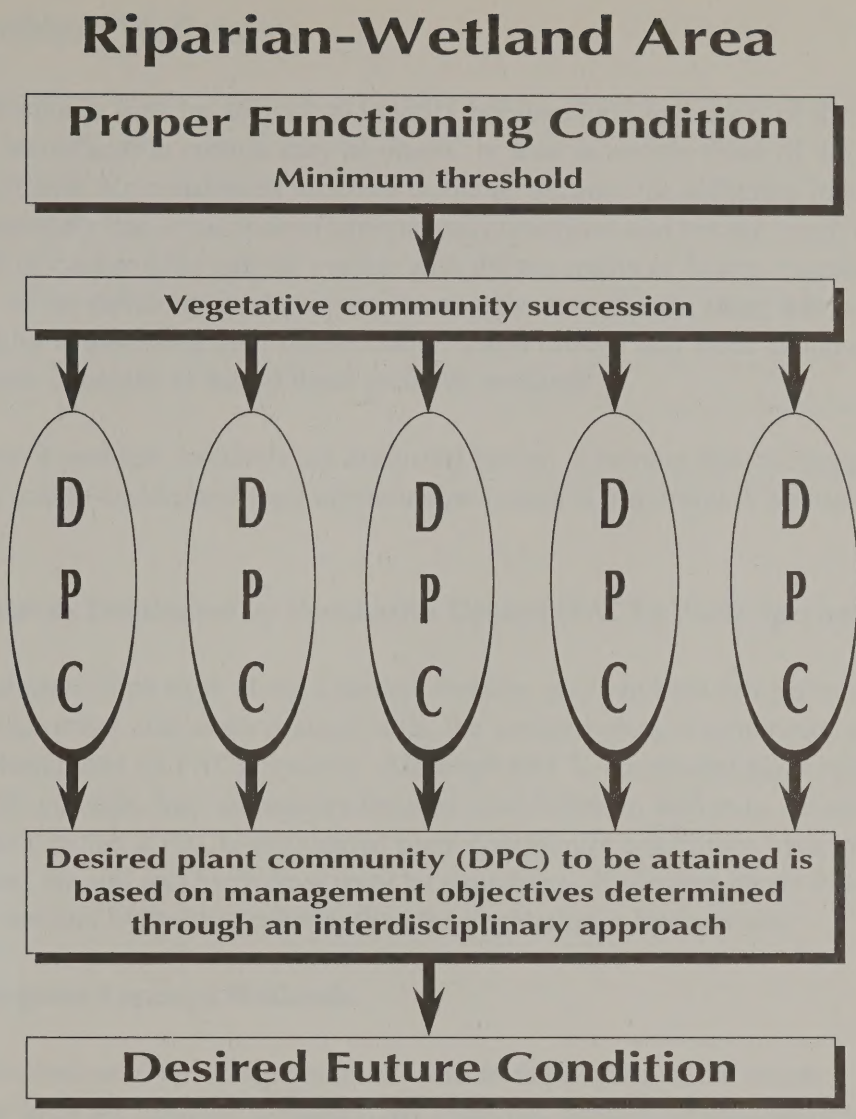

Riparian-Wetland Area
Proper Functioning Condition
Minimum threshold
Vegetative community succession
D P C
D P C
D P C
D P C
D P C
Desired plant community (DPC) to be attained is based on management objectives determined through an interdisciplinary approach
Desired Future Condition

**Figure 2.**

To provide consistency in reporting PFC, BLM has established a standard checklist for lentic riparian-wetland areas for field offices to initiate this process (Appendix A). BLM's lentic checklist may not answer the question of functionality for all lentic riparian-wetland areas. On occasion, field offices will find that blending the lentic checklist with the lotic checklist is necessary to assess functionality for some riparian-wetland areas. Some areas may require a more intensive inventory effort, like ESI.

Field offices can add elements to BLM's lentic or lotic checklist to address unique riparian-wetland attributes and processes. **If elements are added, field offices need to make sure additions can be quantified.**

To further assist field offices in assessing functionality, Appendix B provides examples of lentic riparian-wetland areas that depict categories of PFC, functional — at risk, and nonfunctional.

## III. Problem Wetlands

Certain wetlands may be difficult to identify because field indicators of the three wetland identification criteria may be absent, at least at certain times of the year. These wetlands are considered problem wetlands because the difficulty in identification is generally due to normal environmental conditions and not the result of human activities or catastrophic natural events, with the exception of newly created wetlands. Because of the difficulty in identifying these areas as wetlands, there will be a degree of difficulty in assessing their functionality. Field offices may need to add elements to the lentic checklist to assess these problem wetlands.

Examples of problem wetlands are discussed below. Learning how to recognize these wetlands and to understand their attributes/processes is important in assessing functionality.

### A. Wetlands Dominated by Facultative Upland (FACU) Plant Species

Since wetlands often exist along a natural wetness gradient between permanently flooded substrates and better drained soils, the wetland plant communities sometimes may be dominated by FACU species. Although FACU-dominated plant communities are usually uplands, they sometimes become established in wetlands. In order to determine whether a FACU-dominated plant community constitutes hydrophytic vegetation, the soil and hydrology must be examined. If the area meets the hydric soil and wetland hydrology criteria, then the vegetation is hydrophytic.

### B. Evergreen Forested Wetlands

Wetlands dominated by evergreen trees occur in many parts of the country. In some cases, the trees are obligate wetland (OBL) species, facultative wetland (FACW) species, and facultative (FAC) species, e.g., Atlantic white cedar (*Chamaecyparis thyoides*), black spruce (*Picea mariana*), balsam fir (*Abies balsamae*), slash pine (*Pinus elliottii*), and loblolly pine (*P. taeda*). In other cases, however, the dominant evergreen trees are FACU species, including red spruce (*Picea rubens*), Engelmann spruce (*P. engelmannii*), white spruce (*P. glauce*), Sitka spruce (*P. sitchensis*), eastern white pine (*Pinus strobus*), pitch pine (*P. rigida*), lodgepole pine (*P. contorta*), longleaf pine (*P. palustris*), ponderosa pine (*P. banksiana*), eastern hemlock (*Tsuga canadensis*), western hemlock (*T. heterophylla*), Pacific silver fir (*Abies amabilis*), white fir (*A. concolor*), and subalpine fir (*A. lasiocarpa*). In dense stands, these evergreen trees may preclude the establishment of understory vegetation or, in some cases, understory vegetation is also FACU species. Since these plant communities are usually found on nonwetlands, the ones established in wetland areas may be difficult to recognize at first glance. The landscape position of the evergreen forested areas, such as depressions, drainageways, bottomlands, flats in sloping terrain, and seepage slopes, should be considered because it often provides good clues to the likelihood of a wetland. Soils also should be examined in these situations. Procedures for identifying these wetlands are the same as those for FACU-dominated wetlands described above.

### C. Glacial Till Wetlands

Sloping wetlands occur in glaciated areas where thin soil covers relatively impermeable glacial till or where layers of glacial till have different hydraulic conditions that permit ground-water seepage. Such areas are seldom, if ever, flooded, but downslope ground-water movement keeps the soils saturated for a sufficient portion of the growing season to produce anaerobic and reducing soil conditions. This promotes development of hydric soils and hydrophytic vegetation. Indicators of wetland hydrology may be lacking during the drier portion of the growing season. Hydric soil indicators also may be lacking because certain areas are so rocky that it is difficult to examine soil characteristics within 18 inches.

### D. Highly Variable Seasonal Wetlands

In many regions (especially in arid and semiarid regions), depressional areas occur that may have indicators of all three wetland criteria during the wetter portion of the growing season, but normally lack indicators of wetland hydrology and/or hydrophytic vegetation during the drier portion of the growing season. In addition, some of these areas lack field indicators of hydric soil. OBL and FACW plant species normally are dominant during the wetter portion of the growing season, while FACU and obligate upland (UPL) species (usually annuals) may be dominant during the drier portion of the growing season and for some time after droughts. Examples of highly variable seasonal wetlands are pothole wetlands in the upper Midwest, playa wetlands in the Southwest, and vernal pools along the coast of California. It is important to become familiar with the ecology of these and similar types of wetlands and to be particularly aware of drought conditions that permit invasion of UPL species (even perennials).

### E. Interdunal Swale Wetlands

Along the U.S. coastline, seasonally wet swales supporting hydrophytic vegetation are located within sand dune complexes on barrier islands and beaches. Some of these swales are inundated or saturated to the surface for considerable periods during the growing season, while others are wet for only the early part of the season. In some cases, swales may be flooded irregularly by the tides. These wetlands have sandy soils that generally lack field indicators of hydric soil. In addition, indicators of wetland hydrology may be absent during the drier part of the growing season. Consequently, these wetlands may be difficult to identify.

### F. Vegetated River Bars and Adjacent Flats Wetlands

Along Western streams in arid and semiarid parts of the country, some river bars and flats may be vegetated by FACU species while others may be colonized by wetter species. If these areas are frequently inundated for 1 or more weeks during the growing season, they are wetlands. The soils often do not reflect the characteristic field indicators of hydric soils, however, and thereby pose delineation problems.

## G. Vegetated Flats Wetlands

Vegetated flats are characterized by a marked seasonal periodicity in plant growth. They are dominated by annual OBL species, such as wild rice (*Zizania aquatica*), and/or perennial OBL species, such as spatterdock (*Nuphar luteum*), that have non-persistent vegetative parts (i.e., leaves and stems break down rapidly during the winter, providing no evidence of the plant on the wetland surface at the beginning of the next growing season). During winter and early spring, these areas lack vegetative cover and resemble mud flats; therefore, they do not appear to qualify as wetlands. But during the growing season the vegetation becomes increasingly evident, qualifying the area as a wetland. In evaluating these areas, which occur both in coastal and interior parts of the country, the time of year of the field observation and the seasonality of the vegetation must be considered. Again, it is important to become familiar with the ecology of these wetland types.

## H. Newly Created Wetlands

These wetlands include manmade (artificial) wetlands, beaver-created wetlands, and other natural wetlands. Artificial wetlands may be purposely or accidentally created by human activities (e.g., road impoundments, undersized culverts, irrigation, and seepage from earth-dammed impoundments). Many of these areas will have indicators of wetland hydrology and hydrophytic vegetation. But the area may lack typical field characteristics of hydric soils, since the soils have just recently been inundated and/or saturated. Since all of these wetlands are newly established, field indicators of one or more of the wetland identification criteria may not be present.

## I. Entisols (Floodplain and Sandy Soils) Wetlands

Entisols are usually young or recently formed soils that have little or no evidence of pedogenically developed horizons. These soils are typical of floodplains throughout the U.S., but are also found in glacial outwash plains, along tidal waters, and in other areas. They include sandy soils of riverine islands, bars, and banks and finer-textured soils of floodplain terraces. Wet entisols have an aquic or peraquic moisture regime and are considered hydric soils, unless effectively drained. Some entisols are easily recognized as hydric soils, such as the sulfaquents of tidal salt marshes, whereas others pose problems because they do not possess typical hydric soil field indicators. Wet sandy entisols (with loamy fine sand and coarser textures in horizons within 20 inches of the surface) may lack sufficient organic matter and clay to develop hydric soil colors. When these soils have a hue between 10YR and 10Y and distinct or prominent mottles present, a chroma of 3 or less is permitted to identify the soil as hydric (i.e., an aquic moisture regime).

## J. Mollisols (Prairie and Steppe Soils) Wetlands

Mollisols are dark-colored, base-rich soils. They are common in the central part of the conterminous U.S. from eastern Illinois to Montana and south to Texas. Natural vegetation is mainly tall grass prairies and short grass steppes. These soils typically have deep, dark topsoil layers (mollic epipedons) and low chroma matrix colors to

considerable depths. They are rich in organic matter due largely to the vegetation (deep roots) and reworking of the soil and organic matter by earthworms, ants, moles, and rodents. The low chroma colors of mollisols are not necessarily due to prolonged saturation, so making wetland determinations in these soils requires particular care. It is important to become familiar with the characteristics of mollisols with aquic moisture regimes, since they are usually hydric, unless effectively drained, and to be able to distinguish these from nonhydric mollisols.

## IV. Instituting the Process

### A. Planning

The process established in TR 1737-9 for incorporating the information collected into a management plan would apply to lentic riparian-wetland areas also. That process is as follows:

**Step 1** **Existing Condition** - Determine the existing riparian-wetland and watershed condition using BLM standard inventory methods.

**Step 2** **Potential Condition** - Determine PNC by using relic areas, historic photos, etc. (ESI process).

**Step 3** **PFC** - Determine the minimum conditions required for the area to function properly.

**Step 4** **Resource Values** - Determine existing and potential resource values and the plant communities necessary to support these values.

**Step 5** **Management Goals** - Negotiate specific objectives to reach management goals for the watershed, DPC, or DFC.

**Step 6** **Planned Actions** - Design management actions to achieve the DPC.

**Step 7** **Monitoring** - Design appropriate monitoring strategies to assess progress towards meeting management goals.

**Step 8** **Flexibility** - Maintain management flexibility to accommodate change based upon monitoring results.

### B. Management

For BLM to be successful in reaching its goal of having 75 percent of its riparian-wetland areas functioning properly by 1997, best management practices need to be set in motion. Successful management strategies address the entire watershed. Upland and riparian-wetland areas are interrelated and cannot be considered separately. Technical references such as TR 1737-4 (Kinch, 1989) and TR 1737-6 (Smith and Prichard, 1992) are tools that can be used to develop management techniques.

### C. Monitoring

Management effectiveness can be assessed and progress towards meeting PFC can be documented through monitoring. Sites should be revisited periodically as part of the overall monitoring program. Areas rated at a single point in time can reflect short-term factors such as climatic conditions. Monitoring will reflect longer-term trends. Technical references such as TR 1737-3 (Myers, 1989) are tools that can be used to develop monitoring criteria.

## V. Summary

Riparian-wetland areas constitute an important resource on lands managed by BLM. BLM's goal is to have 75 percent of its riparian-wetlands functioning properly by 1997. This document supplements TR 1737-9 and provides a thought process for assessing functioning condition of lentic riparian-wetland areas.

The status of some lentic riparian-wetland areas will be relatively easy to discern while the status of others will be less evident. Appendix A contains the minimum national standards that BLM field offices will use in making this assessment for lentic riparian-wetland areas. For hard-to-discern areas, Ecological Site Inventory may be the only method to determine capability and potential and assess functionality. Using either method requires an interdisciplinary team to adequately address the complexities associated with lentic riparian-wetland areas and to report their functioning condition.

The lack of specific information will place many lentic riparian-wetland areas into the category of unknown. In order for BLM to make an adequate assessment of progress towards its goal, it is imperative that areas for which no data exists be evaluated and added to the data base. As information is acquired and resource values are identified, best management practices need to be set in motion. Successful management strategies have to address the entire watershed, as upland and riparian-wetland areas are interrelated and cannot be considered separately.

# Literature Cited

Kinch, G. 1989. Riparian Area Management: Grazing Management in Riparian Areas. TR 1737-4. Bureau of Land Management, BLM/YA/PT-87/021+1737, Service Center, CO. 48 pp.

Leonard, S., G. Staidl, J. Fogg, K. Gebhardt, W. Hagenbuck, and D. Prichard. 1992. Riparian Area Management: Procedures for Ecological Site Inventory - With Special Reference to Riparian-Wetland Sites. TR 1737-7. Bureau of Land Management, BLM/SC/PT-92/004+1737, Service Center, CO. 135 pp.

Myers, L.H. 1989. Riparian Area Management: Inventory and Monitoring of Riparian Areas. TR 1737-3. Bureau of Land Management, BLM/YA/PT-89/022+1737, Service Center, CO. 89 pp.

Prichard, D., H. Barrett, J. Cagney, R. Clark, J. Fogg, K. Gebhardt, P. Hansen, B. Mitchell, and D. Tippy. 1993. Riparian Areas Management: Process for Assessing Proper Functioning Condition. TR-1737-9. Bureau of Land Management, BLM/SC/ST-93/003+1737, Service Center, CO. 60 pp.

Smith, B. and D. Prichard. 1992. Riparian Area Management: Management Techniques in Riparian Areas. TR 1737-6. Bureau of Land Management, BLM/SC/PT-92/003+1737, Service Center, CO. 44 pp.

U.S. Department of the Interior. 1991. Riparian-Wetland Initiative for the 1990's. Bureau of Land Management, BLM/WO/GI-91/001+4340, Washington, DC. 50 pp.

_____. 1992. BLM Manual 1737 - Riparian-Wetland Area Management. Bureau of Land Management, Washington, DC. 38 pp.

# Glossary of Terms

**Advanced Ecological Status** - A community with a high coefficient of similarity to a defined or perceived PNC for an ecological site, usually late seral or PNC ecological status.

**Aerobic** - A condition in which molecular oxygen is a part of the environment.

**Anaerobic** - A condition in which molecular oxygen is absent (or effectively so) from the environment.

**Duration-Frequency** - A general descriptive term for the average duration of soil inundation per flood occurrence for a geographic area. Categories include: very brief (less than 2 days); brief (2 to 7 days); long (7 days to 1 month); very long (more than 1 month); and flash flooding (less than 2 hours).

**Facultative (FAC) Species** - Plant species that are equally likely to occur in wetlands or nonwetlands (estimated probability 34-66%).

**Facultative Upland (FACU) Species** - Plant species that usually occur in nonwetlands (estimated probability 67-99%), but occasionally are found in wetlands (estimated probability 1-33%).

**Facultative Wetland (FACW) Species** - Plant species that usually occur in wetlands (estimated probability 67-99%), but occasionally are found in nonwetlands.

**Frost (or abnormal hydrologic) Heaving** - The lifting of a surface by the internal action of frost or hydrostatic pressure. It generally occurs after a thaw, when the soil is filled with water droplets and the temperature suddenly drops below freezing; the droplets then become ice crystals, and their expansion causes an upward movement of the soil. The process is exacerbated when there is compaction between plant tussocks (e.g., from hoof action) and/or excessive removal of thermal vegetation cover. The result is the hummocked appearance of plants being elevated above the normal ground surface, root shearing between plants, and exposure of interspaces to increased erosional forces.

**Hydric Soils** - Soils that are flooded, ponded, or saturated for usually 1 week or more during the period when soil temperatures are above biologic zero (41° F). Complete criteria can be found in BLM Technical Reference 1737-7.

**Obligate Upland (UPL) Species** - Plant species that occur in wetlands in another region, but occur almost always (estimated probability >99%) under natural conditions in nonwetlands in the region specified.

**Obligate Wetland (OBL) Species** - Plant species that occur almost always (estimated probability >99%) under natural conditions in wetlands.

**Ponding-Frequency** - A general descriptive term for the relative change of reoccurrence of a flooding event for a geographic area. Categories include: none (0 percent chance); rare (0 to 5 percent chance); occasional (5 to 50 percent chance); and frequent (greater than 50 percent chance).

**Potential Plant Community** - Represents the seral stage the botanical community would achieve if all successional sequences were completed without human interference under the present environmental conditions.

**Riparian-Wetland Ecological Site** - An area of land with a specific potential plant community and specific physical site characteristics, differing from other areas of land in its ability to produce vegetation and to respond to management. Ecological site is synonymous with range site.

**Vegetation Community Dynamics** - Response of plant communities to changes in their environment, to their use, and to stresses to which they are subjected. Climatic cycles, fire, insects, grazing, and physical disturbances are some of the many causes of changes in plant communities. Some changes are temporary while others are long lasting.

**Vegetation Community Succession** - Primary succession is a sequence of plant community changes from the initial colonization of a bare soil toward a PNC. Secondary succession may involve sequences of plant community change from PNC due to perturbations, or a sequence toward PNC again following a perturbation. Vegetation community succession may be accompanied by subtle but significant changes in temporal soil characteristics such as bulk density, nutrient cycling, and microclimatic changes, but is differentiated from major physical state changes such as landform modification or long-term elevation or lowering of a water table that would change the PNC of an ecological site.

# Appendix A

# Lentic Riparian-Wetland Functional Checklist

## General Instructions

1) The concept "**Relative to Capability**" applies wherever it may be inferred.

2) This checklist constitutes the **Minimum National Standards** required to determine Proper Functioning Condition of lentic riparian-wetland areas.

3) As a minimum, an **ID Team** will use this checklist to determine the degree of function of a lentic riparian-wetland area.

4) Mark one box for each element. Elements are numbered for the purpose of cataloging comments. The numbers do not declare importance.

5) For any item marked "**No,**" the severity of the condition must be explained in the "**Remarks**" section and must be a subject for discussion with the ID Team in determining riparian-wetland functionality. Using the "**Remarks**" section to also explain items marked "**Yes**" is encouraged but not required.

6) Based on the ID Team's discussion, "**functional rating**" will be resolved and the checklist's summary section will be completed.

7) Establish photo points where possible to document the site.

## Lentic Standard Checklist

Name of Riparian-Wetland Area: _____

Date: _____ Area/Segment ID: _____ Acres: _____

ID Team Observers: _____

| Yes | No | N/A | HYDROLOGIC |
|---|---|---|---|
| | | | 1) Riparian-wetland area is saturated at or near the surface or inundated in "relatively frequent" events (1-3 years) |
| | | | 2) Fluctuation of water levels is not excessive |
| | | | 3) Riparian-wetland zone is enlarging or has achieved potential extent |
| | | | 4) Upland watershed not contributing to riparian-wetland degradation |
| | | | 5) Water quality is sufficient to support riparian-wetland plants |
| | | | 6) Natural surface or subsurface flow patterns are not altered by disturbance (i.e., hoof action, dams, dikes, trails, roads, rills, gullies, drilling activities) |
| | | | 7) Structure accommodates safe passage of flows (e.g., no headcut affecting dam or spillway) |

| Yes | No | N/A | VEGETATION |
|---|---|---|---|
| | | | 8) Diverse age-class distribution (recruitment for maintenance/recovery) |
| | | | 9) Diverse composition of vegetation (for maintenance/recovery) |
| | | | 10) Species present indicate maintenance of riparian-wetland soil moisture characteristics |
| | | | 11) Vegetation is comprised of those plants or plant communities that have root masses capable of withstanding wind events, wave flow events, or overland flows (e.g., storm events, snowmelt) |
| | | | 12) Riparian-wetland plants exhibit high vigor |
| | | | 13) Adequate vegetative cover present to protect shorelines/soil surface and dissipate energy during high wind and wave events or overland flows |
| | | | 14) Frost or abnormal hydrologic heaving is not present |
| | | | 15) Favorable microsite condition (i.e., woody debris, water temperature, etc.) is maintained by adjacent site characteristics |

| Yes | No | N/A | SOILS-EROSION DEPOSITION |
|---|---|---|---|
| | | | 16) Accumulation of chemicals affecting plant productivity/composition is not apparent |
| | | | 17) Saturation of soils (i.e., ponding, flooding frequency and duration) is sufficient to compose and maintain hydric soils |
| | | | 18) Underlying geologic structure/soil material/permafrost is capable of restricting water percolation |
| | | | 19) Riparian-wetland is in balance with the water and sediment being supplied by the watershed (i.e., no excessive erosion or deposition) |
| | | | 20) Islands and shoreline characteristics (i.e., rocks, course and/or large woody debris) adequate to dissipate wind and wave event energies |

## Remarks

## Summary Determination

**Functional Rating:**

Proper Functioning Condition _____
Functional—At Risk _____
Nonfunctional _____
Unknown _____

**Trend for Functional—At Risk:**

Upward _____
Downward _____
Not Apparent _____

**Are factors contributing to unacceptable conditions outside BLM's control or management?**

Yes _____
No _____

**If yes, what are those factors?**

____ Dewatering ____ Mining activities ____ Watershed condition
____ Dredging activities ____ Road encroachment ____ Land ownership
____ Other (specify) _____

# Appendix B

# Lentic Riparian-Wetland Examples

## Forested Wetland—Oregon
## Proper Functioning Condition

Clay Bridges

## Forested Wetland—Oregon
## Functional—At Risk

Clay Bridges

## Forested Wetland—Oregon
## Proper Functioning Condition

The photo to the left is an example of a landslide sag pond found in the Coastal Range, Oregon. This lentic form of wetland would be rated ***PFC*** relative to BLM's definition. The wetland contains adequate vegetation, landform, and large woody debris which provide root masses that stabilize shoreline features against cutting actions; filter sediment and aid floodplain development; maintain hydric soils; restrict water percolation; and provide favorable microsite conditions that support greater biodiversity.

---

## Forested Wetland—Oregon
## Functional—At Risk

The photo to the left is an example of a lentic wetland in Oregon that would be rated ***functional — at risk.*** Most of the physical attributes/processes (i.e., diverse composition of vegetation for maintenance/recovery, underlying materials that restrict water percolation, etc.) are in place to allow this system to function properly. However, this wetland is rated ***functional — at risk*** because it lacks adjacent site characteristics to control water temperatures and to prevent soils from inundating the site due to excessive erosion.

## Lacustrine Wetland—New Mexico
## Functional—At Risk

Clay Bridges

---

## Playa Wetland—New Mexico
## Proper Functioning Condition

Clay Bridges

## Lacustrine Wetland—New Mexico
## Functional—At Risk

This photo shows an example of a lacustrine wetland in New Mexico that would be rated ***functional — at risk*** because natural overland flow patterns have been altered by surface disturbances. Surface disturbances, like the trails in this photo, intercept, divert, and concentrate overland flows away from the wetland site. This diversion and concentration of overland flows increase energies which form headcuts that drain the site, thus reducing the wetland's ability to maintain hydric soils and associated vegetation. If allowed to continue, the wetland will eventually be lost.

---

## Playa Wetland—New Mexico
## Proper Functioning Condition

In New Mexico, depressional areas (playas) such as in the photo to the left have wetland indicators during the wetter portion of a growing season, but normally lack indicators during the drier portion of the growing season (see Problem Wetlands section for more information). Assessing functionality of a playa requires understanding that system's attributes/processes (i.e., ponding frequency and duration, community dynamics and succession, recruitment and reproduction, etc.). The playa wetland in this photo would normally be rated ***PFC***.

This wetland would be rated ***functional — at risk*** if underlying materials have been disturbed that restricted percolation, or overland flows to the playa have been restricted. Alteration of the natural topography that drains the wetland would result in a rating of ***nonfunctional***.

## Lacustrine Wetland—Colorado
## Functional—At Risk/Proper Functioning Condition

BLM Kremmling Resource Area

## Seep Wetland—Nevada
## Nonfunctional

Mark Biddlecomb

## Lacustrine Wetland—Colorado
## Functional—At Risk/Proper Functioning Condition

The lacustrine wetland in the photo to the left would be rated ***functional — at risk*** on the left side and ***PFC*** on the right side. Most of the attributes/processes on the left side indicate a functioning system (i.e., diverse composition of vegetation, saturation of soils sufficient to compose and maintain hydric soils, no excessive erosion or deposition, etc.). The left side is rated ***functional — at risk*** due to the presence of abnormal hydrologic heaving. Over time, hydrologic heaving will change composition of vegetation and may drain the site.

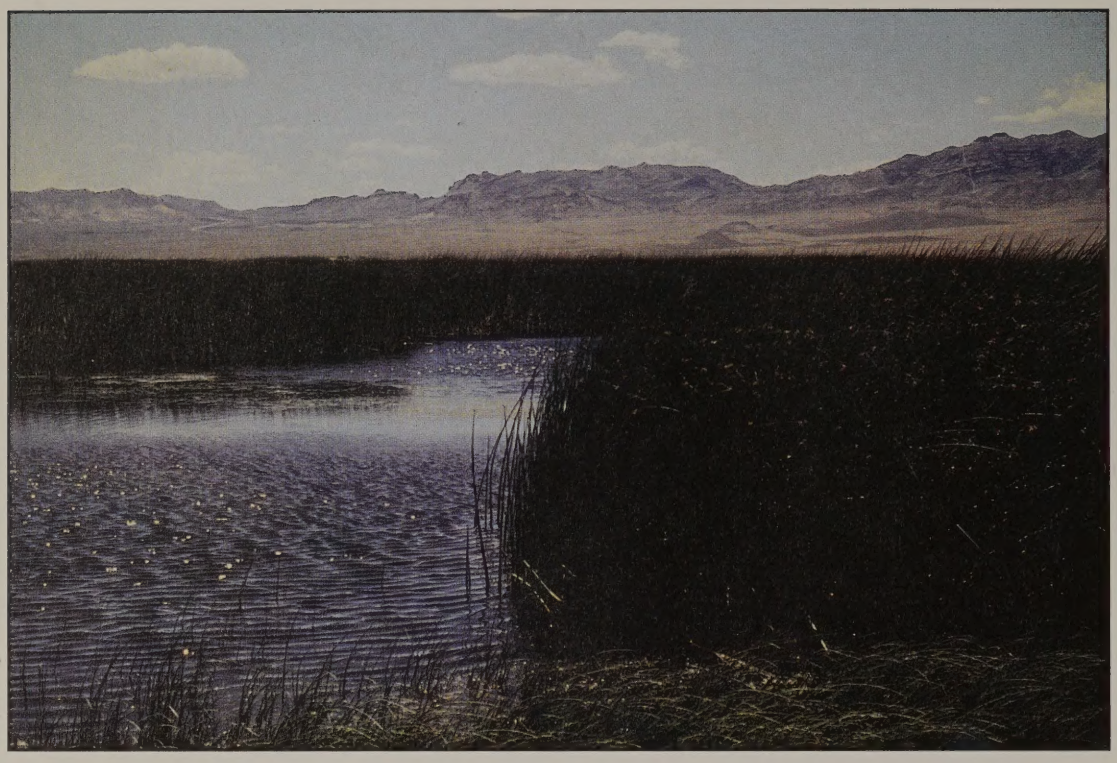
All the attributes/process on the right side of this photo indicate a functioning system.

---

## Seep Wetland—Nevada
## Nonfunctional

The photo to the left shows an example of a seep located in Nevada that would be rated as ***nonfunctional*** relative to BLM's definition for proper functioning condition. This wetland **clearly** does not provide adequate vegetation to filter sediment and aid wetland development, lacks adequate cover to protect the area from erosion or deposition as a result of overland flows, lacks diverse age-class distribution and composition of vegetation to allow recovery, and does not provide wetland characteristics necessary to support aquatic or other species. This lack of vegetation and the area's lack of balance with the sediment being supplied have permitted three things to occur: 1) the extent of the wetland has been greatly reduced, 2) the wetland's water quality has been altered, and 3) the wetland's diversity of aquatic vegetation has been greatly reduced. The area provides little biodiversity.

## Palustrine Wetland—Nevada
## Proper Functioning Condition



Clay Bridges

## Wet Meadow Wetland—Idaho
## Functional—At Risk

Steve Leonard

## Palustrine Wetland—Nevada
## Proper Functioning Condition

Wetlands that have achieved late seral or PNC, as Locke's Pond has in the photo at left, can easily be placed into the appropriate category. Using the Bureau definition, Locke's Pond would have a rating of ***PFC***. Completing a lentic checklist on this area would result in a yes or N/A answer for the 20 items. The physical processes are functioning, and the wetland is supporting diverse ponding characteristics that provide the habitat and the water depth, duration, and temperature necessary for fish production, waterbird breeding, and other uses. Locke's Pond is providing biodiversity.

---

## Wet Meadow Wetland—Idaho
## Functional—At Risk

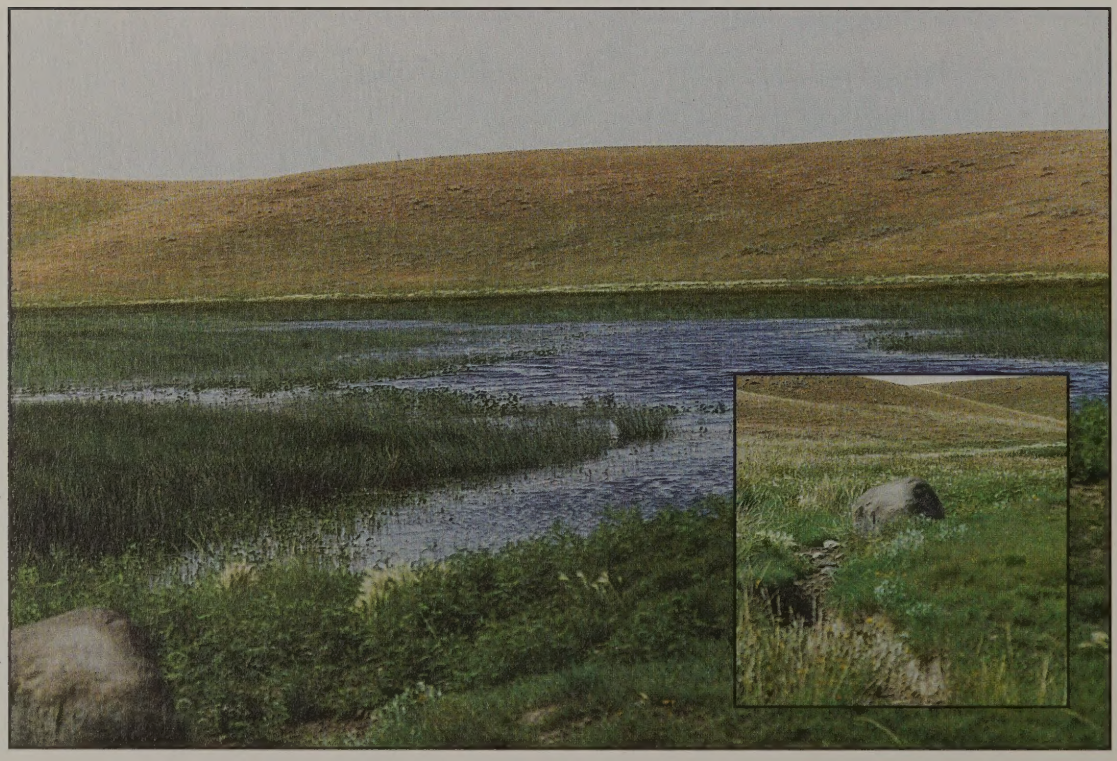
The wet meadow pictured at left would be rated ***functional — at risk*** relative to BLM's definition for proper functioning condition, even though most of the attributes/processes indicate a functioning system. Currently, most of the wetland is saturated at or near the surface with "relatively frequent events" that maintain its hydric soils, contains a diverse composition of vegetation which can maintain the wetland, is comprised of those plants or plant communities that have root masses capable of withstanding overland flow events, and is in balance with the water and sediment being supplied by the watershed (i.e., no excessive erosion or deposition), etc.

The reason this wetland is rated ***functional — at risk*** is that abnormal frost heaving is present. Hydrologic or frost heaving, allowed to continue over time, will change the vegetation composition. This change in vegetation will reduce the extent of the wetland and may eventually drain the wetland.

## Prairie Pothole Wetland—Montana
## Proper Functioning Condition

Ramone McCoy

## Prairie Pothole Wetland—Montana
## Functional—At Risk



Photos by: Ramone McCoy

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## Prairie Pothole Wetland—Montana
## Proper Functioning Condition

Prairie potholes are classified as highly variable seasonal wetlands. During drier climatic cycles or the drier portion of a growing season, these wetlands may lack hydrology and/or hydrophytic vegetation indicators that would identify them as wetlands. During wet years, they provide a diverse composition of wetland vegetation, but during dry years, the wetland species may be replaced with upland species. Potholes in Montana, on average, are inundated only 1 in 5 years.

The photo to the left shows an example of a Montana prairie pothole wetland that would be rated ***PFC***. This pothole contains adequate vegetation to dissipate energies associated with wind action, wave action, and overland flow from adjacent sites; restricts water percolation; provides ponding characteristics that provide habitat for waterbird breeding; etc., relative to its capability and potential.

---

## Prairie Pothole Wetland—Montana
## Functional—At Risk

The photos to the left show an example of an artificially enhanced prairie pothole. An earthen dam has been constructed that collects and stores additional overland flow, creating a more permanent site. Previously this pothole would have been classified as highly variable seasonal wetland, but now it would be classified as a palustrine wetland.

At first glance this wetland would be rated ***PFC***. The wetland is saturated at or near the surface in relatively frequent events, provides water quality that supports wetland plants, provides a diverse age class and composition of vegetation, has adequate vegetative cover to protect shorelines during high wind and wave events, and provides greater biodiversity, etc. However, this wetland is not rated ***PFC*** because the structure is no longer accommodating the safe passage of flows. A headcut has developed in the spillway that threatens the integrity of the dam (see insert). The spillway is located to the left of the rock in the main photo. The correct rating would be ***functional — at risk***.

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This technical reference outlines the Bureau of Land Management's (BLM's) process for assessing the functioning condition of lentic riparian-wetland areas on public lands. Emphasis is placed on the interaction of vegetation, landform/soils, and hydrology in defining capability and potential of an area. The importance of using an interdisciplinary team is also stressed.

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